MATHS

BOOKS - RD SHARMA MATHS (ENGLISH)

ALGEBRA OF MATRICES

Others

1. Express the matrix $A = \begin{bmatrix} 4 & 2 & -1 \\ 3 & 5 & 7 \\ 1 & -2 & 1 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrix.

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2. A matrix which is both symmetric as well as skew-symmetric is a null matrix.

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3. Show that positive odd integral powers of a skew-symmetric matrix are skew-symmetric and positive even integral powers of a skew-symmetric matrix are symmetric.

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4. Show that all positive integral powers of a symmetric matrix are symmetric.

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5. If B is a skew-symmetric matrix, write whether the matrix ABA^T is symmetric or skew-symmetric.

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6. If matrix $A = [a_{ij}]_{2X2}$, where $a_{ij} = \begin{Bmatrix} 1 & i \neq j \\ 0 & i = j \end{Bmatrix}$, $thenA^2$ is equal to

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7. Find the value of λ, a non-zero scalar, if $\lambda\begin{bmatrix} 1 & 0 & 2 \\ 3 & 4 & 5 \end{bmatrix} + 2\begin{bmatrix} 1 & 2 & 3 \\ -1 & -3 & 2 \end{bmatrix} = \begin{bmatrix} 4 & 4 & 10 \\ 4 & 2 & 14 \end{bmatrix}$

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8. Solve the matrix equation $\begin{bmatrix} x^2 \\ y^2 \end{bmatrix} - 3\begin{bmatrix} x \\ 2y \end{bmatrix} = \begin{bmatrix} -2 \\ 9 \end{bmatrix}$

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9. If $A, BandC$ three matrices of the same order, then prove that $A = B \Rightarrow A + C = B + C$

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10. Find non-zero values of x and z satisfying the matrix equation :

$$x\begin{bmatrix}2x & 2\\ 3 & x\end{bmatrix}+2\begin{bmatrix}8 & 5x\\ 4 & 4x\end{bmatrix}=2\begin{bmatrix}x^2+8 & 24\\ 10 & 6z\end{bmatrix}$$

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11. Find a matrix A ,if $A+\begin{bmatrix}2 & 3\\ -1 & 4\end{bmatrix}=\begin{bmatrix}3 & -6\\ -3 & 8\end{bmatrix}$

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12. If $A=diag(1-12)$ and $B=diag(2,3-1)$, find $A+B, 3A+4B$.

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13. If $A=\begin{bmatrix}2 & -1\\ 3 & 1\end{bmatrix}$ and $B=\begin{bmatrix}1 & 4\\ 7 & 2\end{bmatrix}$, find $3A-2B$

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14. Find the values of a and b if $A = B$, where $A = \begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix}$, $B = \begin{bmatrix} 2a+2 & b^2+2 \\ 8 & b^2-5b \end{bmatrix}$

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15. Find the values of x and y if $\begin{bmatrix} x+10 & y^2+2y \\ 0 & -4 \end{bmatrix} = \begin{bmatrix} 3x+4 & 3 \\ 0 & y^2-5y \end{bmatrix}$

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16. For what values of x and y are the following matrices equal? $A = \begin{bmatrix} 2x+1 & 3y \\ 0 & y^2-5y \end{bmatrix} B = \begin{bmatrix} x+3 & y^2+2 \\ 0 & -6 \end{bmatrix}$

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17. Let A, B be two matrices such that they commute. Show that for any positive integer n, $AB^n = B^nA$

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18. Let $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$ and $f(x) = x^2 - 4x + 7$ Show that $f(A) = 0$ Use this result of find A^5

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19. If $A = [35], B = [73],$ then find a non-zero matrix C such that AC=BC.

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20. If A is a square matrix such that $A^2 = A,$ show that $(I + A)^3 = 7A + I\cdot$

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21. Under what conditions is the matrix $A^2 - B^2 = (A - B)(A + B)$ is true?

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22. If a is a non-zero real or complex number. Use the principle of mathematical induction to prove that: $If A = \begin{bmatrix} a & 1 \\ 0 & a \end{bmatrix}, then A^n = \begin{bmatrix} a^n & na^{n-1} \\ 0 & a^n \end{bmatrix}$ for every positive integer n.

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23. If $A = \begin{bmatrix} \cos^2\theta & \cos\theta\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta \end{bmatrix}$ B= $\begin{bmatrix} \cos^2\phi & \cos\phi\sin\phi \\ \cos\phi\sin\phi & \sin^2\phi \end{bmatrix}$ and $\theta - \phi = (2n+1)\frac{\pi}{2}$ Find AB.

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24. If A and B are square matrices of order n, then prove that $A \text{ and } B$ will commute iff $A - \lambda I \text{ and } B - \lambda I$ commute for every scalar λ.

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25. Show that positive odd integral powers of a skew-symmetric matrix are skew-symmetric and positive even integral powers of a skew-symmetric matrix are symmetric.

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26. If $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, then find the values of θ satisfying the equation $A^T + A = I_2$.

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27. If $A = diag(abc)$, show that $A^n = diag(a^n b^n c^n)$ for all positive integer n.

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28. If $A = \begin{bmatrix} \cos\theta & i\sin\theta \\ i\sin\theta & \cos\theta \end{bmatrix}$, then prove by principal of mathematical induction that $A^n = \begin{bmatrix} \cos n\theta & i\sin n\theta \\ i\sin n\theta & \cos n\theta \end{bmatrix}$ for all n $\in \mathbb{N}$.

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29. Let $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 1 & 3 \\ 1 & 2 & 1 \end{bmatrix} andB = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 0 & 1 & 1 \end{bmatrix}$. Find A^T, B^T and verify that (i) $(A+B)^T = A^T + B^T$ (ii) $(AB)^T = B^T A^T$ (iii) $(2A)^T = 2A^T$

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30. If $\begin{bmatrix} xy & 4 \\ z+6 & x+y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$, write the value of $(x+y+z)$.

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31. If $A = [a_{ij}]$ is a skew-symmetric matrix, then write the value of $\sum_i a_{ij}$.

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32. Express the matrix $[3 - 2 - 43 - 2 - 5 - 112]$ as the sum of a symmetric and skew-symmetric matrix.

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33. Show that the elements on the main diagonal of a skew-symmetric matrix are all zero.

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34. If A is a skew-symmetric and $n \in N$ such that $(A^n)^T = \lambda A^n,$ write the value of λ .

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35. If A is a skew-symmetric matrix and n is an odd natural number, write whether A^n is symmetric or skew-symmetric or neither of the two.

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36. Show that the matrix $B^T AB$ is symmetric or skew-symmetric according as A is symmetric or skew-symmetric.

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37. If A is a symmetric matrix and $n \in N,$ write whether A^n is symmetric or skew-symmetric or neither of these two.

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38. If $S=[S_{ij}]$ is a scalar matrix such that $s_{ii}=k$ and A is a square matrix of the same order, then $AS=SA=?$ A^k (b) $k+A$ (c) kA (d) kS

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39. If A is a square matrix, using mathematical induction prove that $(A^T)^n=(A^n)^T$ for all $n\in N$.

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40. If A and B are square matrices of the same order such that $AB=BA$, then show that $(A+B)^2=A^2+2AB+B^2$

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41. There are 2 families A and B. There are 4 men, 6 women and 2 children is family A, and 2 men, 2 women and 4 children in family B. The recommend daily amount of calories is 2400 for men, 1900 for women, 1800 for children and 45 grams of proteins for men, 55 grams for women and 33 grams for children. Represent the above information using matrix. Using matrix multiplication, calculate the total requirement for calories and proteins for each of the two families. What awareness can you create among people about the planned diet from this question?

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42. If $A = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & -1 & -4 \end{bmatrix}$ then verify that $(AB)^T = B^T A^T$.

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43. If: $\begin{bmatrix} xy & 5x \\ z+6 & y^2+1 \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$, then find the values of x, y, z and w

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44. The sales figure of two car dealers during January 2013 showed that dealer A sold 5 deluxe, 3 premium and 4 standard cars, while dealer B sold 7 deluxe, 2 premium and 3 standard cars. Total sales over the 2 month period of January-February revealed that dealer A sold 8 deluxe 7 premium and 6 standard cars. In the same 2 month period, dealer B sold 10 deluxe, 5 premium and 7 standard cars. Write 2 x 3 matrices summarizing sales data for January and 2 month period for each dealer.

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45. If $A^T = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$, find $A^T - B^T$

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46. If l_1, m_1, n_1 and l_2, m_2, n_2 are the direction cosines of two mutually perpendicular lines, show that the direction cosines of the line perpendicular to both of these are $m_1n_2 - m_2n_1, n_1l_2 - n_2l_1, l_1m_2 - l_2m_1$.

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47. Construct a 2×3 matrix $A = [a_{ij}]$ whose elements are given by $a_{ij} = \dfrac{1-j}{1+i}$

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48. Construct $a3 \times 2matrix A = [a_{ij}]$ whose elements are given by $a_{ij} = e^{ix} \sin jx \; a_{ij} = e^{-ix} \cos\left(\frac{\pi}{2}i + jx\right)$

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49. For what values of x and y such that matrices A and B are equal ?

$A = \begin{bmatrix} 2x+1 & 3y \\ 0 & y^2 - 5y \end{bmatrix}, B = \begin{bmatrix} x+3 & y^2+2 \\ 0 & -6 \end{bmatrix}$

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50. If $\begin{bmatrix} x-y & z \\ 2x-y & \omega \end{bmatrix} = \begin{bmatrix} -1 & 2 \\ 4 & 7 \end{bmatrix}, then\ x, y, z, \omega is?$

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51. Construct $a3 \times 4 matric A = [a_{ij}]$ whose elements are given by

$a_{ij} = i + j$ (ii) $a_{ij} = i - j$

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52. [[x-y,2x+z] , [2x-y,3z+w]] = [[-1, 5] , [0, 13]], then ,x,y,z,w is?

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53. Find the values of $x, y, zanda$ which satisfy the matrix equation

$$\begin{bmatrix} x+3 & 2y+x \\ z-1 & 4a-6 \end{bmatrix} = \begin{bmatrix} 0 & -7 \\ 3 & 2a \end{bmatrix}$$

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54. In a certain city there are 30 colleges. Each college has 15 peons, 6 clerks, 1 typist and 1 section officer. Express the given information as a column matrix. Using scalar multiplication, find the total number of posts of each kind in all the colleges.

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55. If

$$A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}, B = \begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix}, provethat(A+B)^2 \neq A^2 + 2AB + B^2$$

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56. Find a matrix X such that $2A+B+X=0$, where A= $\begin{bmatrix}-1 & 2\\ 3 & 4\end{bmatrix}$, $B=\begin{bmatrix}3 & -2\\ 1 & 5\end{bmatrix}$ If $A=\begin{bmatrix}8 & 0\\ 4 & -2\\ 3 & 6\end{bmatrix} and B=\begin{bmatrix}2 & -2\\ 4 & 2\\ -5 & 1\end{bmatrix}$,

then find the matrix X of order $3x2$ such that $2A+3X=5B$.

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57. If X and Y are 2×2 matrices, then solve the following matrix equations for X and Y $2X+3Y=\begin{bmatrix}2 & 3\\ 4 & 0\end{bmatrix}$, $3X+2Y=\begin{bmatrix}-2 & 2\\ 1 & -5\end{bmatrix}$

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58. If $A=\begin{bmatrix}\alpha & 0\\ 1 & 1\end{bmatrix} and B=\begin{bmatrix}1 & 0\\ 5 & 1\end{bmatrix}$, find the values of α for which $A^2=B$.

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59. Find the value of x such that $\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = 0$

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60. If

$A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}, B = \begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix} and (A+B)^2 = A^2 + B^2, f \in daandb.$

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61. If $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$, find x and y such that $(xI + yA)^2 = A$

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62. If $\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix} A = \begin{bmatrix} -1 & -8 & -10 \\ 1 & -2 & -5 \\ 9 & 22 & 15 \end{bmatrix}$, find A.

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63. Questions of matrix polynomial Equation

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64. If $A and B$ are symmetric matrices of the same order, write whether AB-BA is symmetric or skew-symmetric or neither of the two.

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65. If A is a square matrix such that $A^2 = A, then (I + A)^3 - 7A$ is equal to (a)A (b) $I - A$ (c) I (d) $3A$

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66. If A is a square matrix such that $A^2 = A$, then write the value of $7A - (I + A)^3,$ where I is the identity matrix.

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67. Construct a 3×4 matrix $A = [a_{ij}]$ whose elements are given by (i) $a_{ij} = i + j$ (ii) $a_{ij} = i - j$

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68. If $[x - y2x + z2x - y3z + w] = [-15013]$, find $x,\ y,\ z,\ w$.

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69. Find $\frac{dy}{dx}$ if $x + y = (\tan x)^2$

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70. A matrix has 12 elements. What are the possible orders it can have?

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71. Find $\frac{dy}{dx}$ If $y = (\sin x)^{\cos x}$.

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72. A matrix has 12 elements. What are the possible orders it can have?

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73. Construct a 2×2 matrix $A = [a_{ij}]$ whose elements are given by $a_{ij} = \frac{(i + 2j)^2}{2}$.

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74. Construct a 2×3 matrix $A = [a_{ij}]$ whose elements are given by $a_{ij} = \frac{i - j}{i + j}$.

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75. Construct a 3×2 matrix $A = [a_{ij}]$ whose elements are given by $a_{ij} = e^{ix} \sin jx$

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76. Find $x,\ y,\ z$ and w such that $\begin{bmatrix} x-y & 2z+w \\ 2x-y & 2x+w \end{bmatrix} = \begin{bmatrix} 5 & 3 \\ 12 & 15 \end{bmatrix}$.

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77. Consider the following information regarding the number of men and women workers in three factories. I, II and III. Men workers Women workers I 30 25 II 25 31 III 27 26 Represent the above information in the form of 3×2 matrix. What does the entry in the third row and second column represent?

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78. If $\begin{bmatrix} a+b & 2 \\ 5 & ab \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$, find the values of a and b.

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79. For what values of x and y are the following matrices equal? $A = \begin{bmatrix} 2x+1 & 3y \\ 0 & y^2-5y \end{bmatrix}, B = \begin{bmatrix} x+3 & y^2+2 \\ 0 & -6 \end{bmatrix}$

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80. If a matrix has 8 elements, what are the possible orders it can have?

What if it has 5 elements?

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81. If $A = [a_{ij}] = \begin{bmatrix} 2 & 3 & -5 \\ 1 & 4 & 9 \\ 0 & 7 & -2 \end{bmatrix}$ and $B = [b_{ij}] = \begin{bmatrix} 2 & -1 \\ -3 & 4 \\ 1 & 2 \end{bmatrix}$ then find

$a_{22} + b_{21}$ (ii) $a_{11}b_{11} + a_{22}b_{22}$

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82. Let A be a matrix of order 3×4. If R_1 denotes the first row of A and C_2 denotes its second column, then determine the orders of matrices R_1 and C_2.

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83. Construct a 2×3 matrix $A = \left[a_{ij}\right]$ whose elements a_{ij} are given by:

(i) $a_{ij} = i \times j$ (ii) $a_{ij} = 2i - j$

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84. Construct a 2×2 matrix $A = \left[a_{ij}\right]$ whose elements a_{ij} are given by:

(i) $a_{ij} = i + j$ (ii) $a_{ij} = \dfrac{(i+j)^2}{2}$

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85. Construct a 2×2 matrix $A = [a_{ij}]$ whose elements a_{ij} are given by:

(i) $\frac{(i+j)^2}{2}$ (ii) $a_{ij} = \frac{(i-j)^2}{2}$ (iii) $a_{ij} = \frac{(i-2j)^2}{2}$

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86. Construct a 2×2 matrix $A = [a_{ij}]$ whose elements a_{ij} are given by:

(i) $a_{ij} = \frac{(2i+j)^2}{2}$ (ii) $a_{ij} = \frac{|2i-3j|}{2}$ (iii) $a_{ij} = \frac{|-3i+j|}{2}$

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87. Construct a 2×2 matrix $A = [a_{ij}]$ whose elements a_{ij} are given by:

(i) $a_{ij} = e^{2ix} \sin xj$

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88. Construct a 3×4 matrix $A = [a_{ij}]$ whose elements a_{ij} are given by:

(i) $a_{ij} = i + j$ (ii) $a_{ij} = 1 - j$ (iii) $a_{ij} = 2i$

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89. Construct a 3×4 matrix $A = [a_{ij}]$ whose elements a_{ij} are given by:

(i) $a_{ij} = j$ (ii) $a_{ij} = \frac{1}{2}|-3i + j|$

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90. Construct a 4×3 matrix $A = [a_{ij}]$ whose elements a_{ij} are given by:

$a_{ij} = 2i + \frac{i}{j}$

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91. Find x, y, a and b if $\begin{bmatrix} 3x+4y & 2 & x-2y \\ a+b & 2a-b & -1 \end{bmatrix} = \begin{bmatrix} 2 & 2 & 4 \\ 5 & -5 & -1 \end{bmatrix}$

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92. Find $x, \ y, \ a$ and b if $\begin{bmatrix} 2x-3y & a-b & 3 \\ 1 & x+4y & 3a+4b \end{bmatrix} = \begin{bmatrix} 1 & -2 & 3 \\ 1 & 6 & 29 \end{bmatrix}$

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93. Find the values of a, b, c and d from the following equations:

$$\begin{bmatrix} 2a+b & a-2b \\ 5c-d & 4c+3d \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 11 & 24 \end{bmatrix}$$

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94. Find x, y and z so that $A = B$, where $A = [x - 232z18zy + 26z]$,

$B = [yz66yx2y]$

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95. If $\begin{bmatrix} x & 3x-y \\ 2x+z & 3y-\omega \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 4 & 7 \end{bmatrix}$, find x, y, z, ω.

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96. If $\begin{bmatrix} x-y & z \\ 2x-y & \omega \end{bmatrix} = \begin{bmatrix} -1 & 4 \\ 0 & 5 \end{bmatrix}$, find x, y, z, ω.

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97. If $\begin{bmatrix} x+3 & z+4 & 2y-7 \\ 4x+6 & a-1 & 0 \\ b-3 & 3b & z+2c \end{bmatrix} = \begin{bmatrix} 0 & 6 & 3y-2 \\ 2x & -3 & 2c+2 \\ 2b+4 & -21 & 0 \end{bmatrix}$ Obtain the values of $a,\ b,\ c,\ x,\ y\ and\ z$.

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98. If $[2x + 15x0y^2 + 1] = [x + 310026]$, find the value of $(x + y)$.

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99. If $[xy4z + 6x + y] = [8w06]$, then find the values of $x,\ y,\ z\ and\ w$.

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100. Give an example of (i) a row matrix which is also a column matrix (ii)a diagonal matrix which is not scalar (iii) a triangular matrix.

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101. The sales figure of two car dealers during January 2013 showed that dealer A sold 5 deluxe, 3 premium and 4 standard cars, while dealer B sold 7 deluxe, 2 premium and 3 standard cars. Total sales over the 2 month period of January-February revealed that dealer A sold 8 deluxe 7 premium and 6 standard cars. In the same 2 month period, dealer B sold 10 deluxe, 5 premium and 7 standard cars. Write 2×3 matrices summarizing sales data for January and 2-month period for each dealer.

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102. For what values of $x \, and \, y$ are the following matrices equal? $A = \left[2x + 12y0y^2 - 5y\right], B = \left[x + 3y^2 + 20 - 6\right]$

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103. Find the values of $x \text{ and } y$ if

$$\begin{bmatrix} x+10 & y^2+2y \\ 0 & -4 \end{bmatrix} = \begin{bmatrix} 3x+4 & 3 \\ 0 & y^2-5y \end{bmatrix}$$

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104. Find the values of $a \text{ and } b$ if $A = B$, where $A = [a + 43b8 - 6]$, $B = [2a + 2b^2 + 28b^2 - 56]$

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105. If $A = \begin{bmatrix} 2 & 3 & 4 \\ 0 & 4 & 6 \\ 5 & 8 & 9 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 0 & 5 \\ 5 & 3 & 2 \\ 0 & 4 & 7 \end{bmatrix}$, find $3A - 2B$.

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106. If $A = \begin{bmatrix} 2 & 3 & -5 \\ 1 & 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 5 & 1 \\ -2 & 7 & 3 \end{bmatrix}$, find $A + B$ and $A - B$

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107. If $A = [2 - 131]$ and $B = [1472]$, find $3A - 2B$.

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108. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & -1 \end{bmatrix}$, find $A + B$, $3A + 4B$.

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109. Simplify:

$\cos\theta[\cos\theta\sin\theta - \sin\theta\cos\theta] + \sin\theta[\sin\theta - \cos\theta\cos\theta\sin\theta]$

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110. Find X and Y , if $X + Y = [7025]$ and $X - Y = [3003]$.

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111. Find a matrix A , if $A + [23 - 14] = [3 - 6 - 38]$.

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112. Find $x,\ y,\ z,\ t$ if $2\begin{bmatrix} x & z \\ y & t \end{bmatrix} + 3\begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix} = 3\begin{bmatrix} 3 & 5 \\ 4 & 6 \end{bmatrix}$.

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113. Find non-zero values of x satisfying the matrix equation:

$x[2x23x] + 2[85x44x] = 2\left[x^2 + 824106x\right]$

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114. If $A,\ B$ and C are three matrices of the same order, then prove that

$A = B \Rightarrow A + C = B + C$.

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115. Find a matrix X such that $2A + B + X = O$, where $A = \begin{bmatrix} -1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -2 \\ 1 & 5 \end{bmatrix}$.

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116. Find a matrix A such that $2A - 3B + 5C = O$, where $B = \begin{bmatrix} -2 & 2 & 0 \\ 3 & 1 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 0 & -2 \\ 7 & 1 & 6 \end{bmatrix}$.

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117. Solve the matrix equation $\left[x^2 y^2\right] - 3[x 2y] = [-29]$.

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118. Two farmers Ramkishan and Gurcharan Singh cultivates only three varieties of rice namely Basmati, Permal and Naura. The sale (in Rupees) of these varieties of rice by both the farmers in the month of September and October are given by the following matrices A and B. (i) Find the combined sales in September and October for each farmer in each variety. (ii) Find the decrease in sales from September to October. (iii) if both farmers receive 2% profit on gross sales, compute the profit for each farmer and for each variety sold in October.

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119. Compute the following sums: $\begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix} + \begin{bmatrix} -2 & 4 \\ 1 & 3 \end{bmatrix}$

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120. Let $A = \begin{bmatrix} 2 & 4 \\ 3 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 \\ -2 & 5 \end{bmatrix}, C = \begin{bmatrix} -2 & 5 \\ 3 & 4 \end{bmatrix}, FIND:$ 3A-2B+3C`

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121. If $A = \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$, $B = \begin{bmatrix} -1 & 0 & 2 \\ 3 & 4 & 1 \end{bmatrix}$, $C = \begin{bmatrix} -1 & 2 & 3 \\ 2 & 1 & 0 \end{bmatrix}$, find $A + B$ and $B + C$ (ii) $2B + 3A$ and $3C - 4B$.

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122. If $A = \begin{bmatrix} -1 & 0 & 2 \\ 3 & 1 & 4 \end{bmatrix}, B = \begin{bmatrix} 0 & -2 & 5 \\ 1 & -3 & 1 \end{bmatrix} \text{ and } C = \begin{bmatrix} 1 & -5 & 2 \\ 6 & 0 & -4 \end{bmatrix}$, then find $(2A - 3B + 4C)$.

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123. If $A = diag\,(2 \ \ -5 \ \ 9)$, $B = diag\,(1 \ \ 1 \ \ -4)$ and $C = diag\,(-6 \ \ 3 \ \ 4)$, find $A - 2B$ (ii) $B + C - 2A$ (iii) $2A + 3B - 5C$

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124. Given the matrices $A = [2113 - 10024]$, $B = [97 - 1354216]$ and $C = [2 - 431 - 10945]$ Verify that $(A + B) + C = A + (B + C)$.

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125. Find matrices X and Y, if $X+Y=\begin{bmatrix}5 & 2\\ 0 & 9\end{bmatrix}$ and $X-Y=\begin{bmatrix}3 & 6\\ 0 & -1\end{bmatrix}$.

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126. Find X if $Y=\begin{bmatrix}3 & 2\\ 1 & 4\end{bmatrix}$ and $2X+Y=\begin{bmatrix}1 & 0\\ -3 & 2\end{bmatrix}$.

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127. Find matrices X and Y, if $2X+Y=[6-60-421]$ and $X+2Y=[325-21-7]$.

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128. If $X - Y = [111110100]$ and $X + Y = [351 - 1141180]$, find X and Y .

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129. Find matrix A , if $[12 - 1049] + A = [9 - 14 - 213]$.

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130. If $A = [9178]$, $B = [15712]$, find matrix C such that $5A + 3B + 2C$ is a null matrix.

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131. If $A = [2 - 242 - 51]$, $B = [804 - 236]$, find matrix X such that $2A + 3X = 5B$.

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132. If $A = \begin{bmatrix} 1 & -3 & 2 \\ 2 & 0 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 & -1 \\ 1 & 0 & -1 \end{bmatrix}$, find a matrix C such that

$(A + B + C)$ is a zero matrix.

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133. Find $x,\ y$ satisfying the matrix equations:

$[x - y2 - 24x6] + [3 - 2210 - 1] = [60052x + y5]$ (ii)

$[xy + 2z - 3] + [y45] = [4912]$

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134. Find $x,\ y$ satisfying the matrix equations:

$x[21] + y[35] + [-8 - 11] = 0$

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135. If $2[345x]+[1y01]=[70105]$, find x and y.

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136. Find the value of λ, a non-zero scalar, if $\lambda[102345]+2[123-1-32]=[44104214]$.

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137. Find a matrix X such that $2A+B+X=O$, where $A=[-1234]$, $B=[3-215]$

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138. If $A=[804-236]$ and $B=[2-242-51]$, then find the matrix X of order 3×2 such that $2A+3X=5B$.

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139. Find $x, \ y, \ z \ and \ t$, if $3[xyzt] = [x6 - 12t] + [4x + yz + t3]$

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140. Find $x, \ y, \ z \ and \ t$, if $2[x57y - 3] + [3412] = [7141514]$

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141. If X and Y are 2×2 matrices, then solve the following matrix equations for X and Y. $2X + 3Y = [2340]$, $3X + 2Y = [-221 - 5]$

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142. In a certain city there are 30 colleges. Each college has 15 peons, 6 clerks, 1 typist and 1 section officer. Express the given information as a column matrix. Using scalar multiplication, find the total number of posts of each kind in all the colleges.

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143. The monthly incomes of Aryan and Babban are in the ratio 3 : 4 and their monthly expenditures are in the ratio 5 : 7. If each saves Rs. 15000 per month, find their monthly incomes using matrix method. This problem reflects which value?

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144. Let $A = \begin{bmatrix} 1 & -2 \\ 3 & 3 \\ 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 & -1 \\ 2 & 4 & -5 \end{bmatrix}$. Find AB and BA and show that $AB \neq BA$.

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145. If A, B, C are matrices such that $A = [xyz], B = \begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$ and $C = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ then find ABC

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146. If

$A = [1 - 123], B = [2110], provethat(A + B)^2 \neq A^2 + 2AB + B^2$

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147. If $A = [1 - 12 - 1]$, $B = [a1b - 1]$ and $(A + B)^2 = A^2 + B^2$, then values of a and b are $a = 4 , b = 1$ (b) $a = 1 , b = 4$ (c) $a = 0 , b = 4$ (d) $a = 2 , b = 4$

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148. If $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$, find $x \ and \ y$ such that $(xI + yA)^2 = A$

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149. If $A = [\alpha 011] and B = [1051]$, find the values of α for which $A^2 = B$.

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150. Let $A - [2 - 134], B - [5274], C - [2538]$. Find a matrix D such that $CD - AB \quad = \quad 0$

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151. Find the value of x such that $[1x1][1322511532][12x] = 0$

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152. If $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then find k so that $A^2 = 8A + kI$

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153. If $[2-110-34]A=[-1-8-101-2-592215],\ f\in dA\cdot$

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154. Let $f(x)=x^2-5x+6$ then find $f(A)$ when $A=\begin{bmatrix}2&0&1\\2&1&3\\1&-1&0\end{bmatrix}$

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155. If $A=[31-12]$, show that $A^2-5A+7I=0$

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156. Prove the following by principle of mathematical induction If $A=\begin{bmatrix}3&-4\\1&-1\end{bmatrix}$, then $A^n=\begin{bmatrix}1+2n&-4n\\n&1-2n\end{bmatrix}$ for every positive integer n

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157. If $A_{\alpha}=\begin{bmatrix}\cos\alpha & \sin\alpha\\ -\sin\alpha & \cos\alpha\end{bmatrix}$, then prove that $A_{\alpha}A_{\beta}=A_{\alpha+\beta}$ for every positive integer n .

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158. If $A_{\alpha}=[\cos\alpha\sin\alpha-\sin\alpha\cos\alpha]$, then prove that $(A_{\alpha})^{n}=[\cos n\,\alpha\sin n\,\alpha-\sin n\,\alpha\cos n\,\alpha]$ for every positive integer n .

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159. If a is a non-zero real or complex number. Use the principle of mathematical induction to prove that: If $A=[a10a]$, then $A^{n}=[a^{\cap}a^{n-1}0a^{n}]$ for every positive integer n.

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160. If $A = \begin{bmatrix} 111 \\ 111 \\ 111 \end{bmatrix}$, then prove that $A^n = \begin{vmatrix} 3^{n-1} 3^{n-1} 3^{n-1} \\ 3^{n-1} 3^{n-1} 3^{n-1} \\ 3^{n-1} 3^{n-1} 3^{n-1} \end{vmatrix}$ for every positive integer n.

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161. Under what conditions is the matrix equation $A^2 - B^2 = (A - B)(A + B)$ is true?

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162. If A is any $m \times n$ such that AB and BA are both defined show that B is an $n \times m$ matrix.

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163. A, B are two matrices such that AB and $A + B$ are both defined; show that A, B are square matrices of the same order.

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164. If A and B are square matrices of order n, then prove that A and B will commute iff $A - \lambda I$ and $B - \lambda I$ commute for every scalar λ

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165. If $AB = A$ and $BA = B$, then show that $A^2 = A$, $B^2 = B$.

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166. Give an example of two matrices A and B such that $A \neq O, B \neq O, AB = O$ and $BA \neq O$ (ii) $A \neq O, B \neq O, AB = BA = O$.

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167. Give an example of three matrices $A,\ B,\ C$ such that $AB = AC$ but $B \ne C$.

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168. There are 2 families A and B. There are 4 men, 6 women and 2 children in family A, and 2 men, 2 women 4 children in family B. The recommend daily amount of calories is 2400 for men, 1900 for women, 1800 for children and 45 grams of proteins for men, 55 grams for women and 33 grams for children. Represent the above information using matrix. Using matrix multiplication, calculate the total requirement of calories and proteins for each of the two families. What awareness can you create among people about the planned diet from this question?

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169. Use matrix multiplication to divide Rs. 30,000 in two parts such that the total annual interest at 9% on the first part and 11% on the second part amounts Rs. 3060

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170. Three schools $A, \ B$ and C organised a mela for collecting funds for helping the rehabilitation of flood victims. They sold hand made fans, mats and plates from recycled material at a cost of Rs. 25, Rs. 100 and Rs. 50 each. The number of articles sold are given below. School/Article A B C Hand-fans 40 25 35 Mats 50 40 50 Plates 20 30 40 Find the funds collected by each school separately by sailing the above articles. Also, find the total funds collected for the purpose.

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171. Prove that the product of matrices $\left[\cos^2\theta\cos\theta\sin\theta\cos\theta\sin\theta\sin^2\theta\right]$ and $\left[\cos^2\varphi\cos\varphi\sin\varphi\cos\varphi\sin\varphi\sin^2\varphi\right]$ is the null matrix, when θ and φ

differ by an odd multiple of $\frac{\pi}{2}$.

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172. Let $A = \begin{bmatrix} 0 & -\tan\left(\frac{\alpha}{2}\right) \\ \tan\left(\frac{\alpha}{2}\right) & 0 \end{bmatrix}$ and I be the identity matrix of order 2. Show that $I + A = (I - A)[\cos\alpha - \sin\alpha \sin\alpha \cos\alpha]$.

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173. Let $F(x) =$ [cosx -sinx 0 sinx cosx 0 0 0 1]. Show that $F(x)\ F(y) = F(x + y)$`

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174. Let $A =$ [2 3-1 2] and $f(x) = x^2 - 4x + 7$. Show that $f(A) = O$. Use this result to find A^5.

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175. If $A = [0100]$, prove that $(aI + bA)^n = a^n I + na^{n-1} bA$ where I is a unit matrix of order 2 and n is a positive integer.

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176. Let $A, \ B$ be two matrices such that they commute. Show that for any positive integer n , $AB^n = B^n A$

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177. Let $A, \ B$ be two matrices such that they commute. Show that for any positive integer n , $(AB)^n = A^n B^n$

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178. If A is a square matrix such that $A^2 = A$, show that $(I + A)^3 = 7A + I$.

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179. If A is a square matrix such that $A^2 = I$, then find the simplified value of $(A - I)^3 + (A + I)^3 - 7A$.

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180. If $A = [3 \quad 5]$, $B = [7 \quad 3]$, then find a non-zero matrix C such that $AC = BC$.

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181. Compute the indicated products: $[ab - ba][a - \mathbf{a}]$ (ii) $[1 - 223][123 - 32 - 1]$ (iii) $[234345456][1 - 35024305]$

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182. Show that $AB \neq BA$ in the following case: $A = [5 - 167]$ and $B = [2134]$

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183. Compute the products AB and BA whichever exists in each of the following cases: $A = \begin{bmatrix} 1 & -2 \\ 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{bmatrix}$ (ii) $A = \begin{bmatrix} 3 & 2 \\ -1 & 0 \\ -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 5 & 6 \\ 0 & 1 & 2 \end{bmatrix}$

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184. Compute the products AB and BA whichever exists in each of the following cases: $A = [1 \ -1 \ 2 \ 3]$ and $B = \begin{bmatrix} 0 \\ 1 \\ 3 \\ 2 \end{bmatrix}$ (ii) $[a \ \ b]\begin{bmatrix} c \\ d \end{bmatrix} + [a \ \ b \ \ c \ \ d]\begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix}$

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185. Show that $AB \neq BA$ in each of the following cases:
$A = \begin{bmatrix} 1 & 3 & -1 \\ 2 & -1 & -1 \\ 3 & 0 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 3 & -1 \\ -1 & 2 & -1 \\ -6 & 9 & -4 \end{bmatrix}$ (ii)
$A = \begin{bmatrix} 10 & -4 & -1 \\ -1 & 1 & 5 \\ 0 & 9 & 51 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 4 & 2 \\ 1 & 3 & 2 \end{bmatrix}$

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186. Evaluate the following: $\left(\begin{bmatrix} 1 & 3 \\ -1 & -4 \end{bmatrix} + \begin{bmatrix} 3 & -2 \\ -1 & 1 \end{bmatrix}\right)\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix}$

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187. If $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ and $C = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then show that $A^2 = B^2 = C^2 = I_2$.

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188. If $A = \begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 4 \\ -1 & 7 \end{bmatrix}$, find $3A^2 - 2B + I$.

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189. If $A = \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$, prove that $(A - 2I)(A - 3I) = O$.

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190. If $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$, show that $A^2 = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ and $A^3 = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$.

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191. If $A = \begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$, show that $A^2 = O$.

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192. If $A = [\cos 2\theta \sin 2\theta - \sin 2\theta \cos 2\theta]$, find A^2.

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193. If $A = \begin{bmatrix} 2 & -3 & -5 \\ -1 & 4 & 5 \\ 1 & -3 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 3 & 5 \\ 1 & -3 & -5 \\ -1 & 3 & 5 \end{bmatrix}$, show that $AB = BA = O_3 \times 3$.

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194. If $A = \begin{bmatrix} 0 & c & -b \\ -c & 0 & a \\ b & -a & 0 \end{bmatrix}$ and $B = \begin{bmatrix} a^2 & ab & ac \\ ab & b^2 & bc \\ ac & bc & c^2 \end{bmatrix}$, show that $AB = BA = O_3 \times 3$.

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195. If $A = \begin{bmatrix} 2 & -3 & -5 \\ -1 & 4 & 5 \\ 1 & -3 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$, show that $AB = A$ and $BA = B$.

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196. Let $A = \begin{bmatrix} -1 & 1 & -1 \\ 3 & -3 & 3 \\ 5 & 5 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 4 & 3 \\ 1 & -3 & -3 \\ -1 & 4 & 4 \end{bmatrix}$, compute $A^2 - B^2$.

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197. For the following matrices verify the associativity of matrix multiplication i.e. $(AB)C = A(BC)$. $A = \begin{bmatrix} 1 & 2 & 0 \\ -1 & 0 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ -1 & 2 \\ 0 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$.

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198. For the following matrices verify the distributivity of matrix multiplication over matrix addition i.e. $A(B + C) = AB + AC$. $A = \begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} -1 & 0 \\ 2 & 1 \end{bmatrix}$ and $C = \begin{bmatrix} 0 & 1 \\ 1 & -1 \end{bmatrix}$

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199. If $A = [10 - 23 - 10 - 211]$, $B = [05 - 4 - 213 - 102]$ and $C = [152 - 1100 - 11]$, verify that $A(B - C) = AB - AC.$

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200. Compute the elements a_{43} and a_{22} of the matrix:
$$A = \begin{bmatrix} 0 & 1 & 0 \\ 2 & 0 & 2 \\ 4 & 0 & 4 \end{bmatrix} \begin{bmatrix} 2 & -1 \\ -3 & 2 \\ 4 & 3 \end{bmatrix} \begin{bmatrix} 0 & 1 & -1 & 2 & -2 \\ 3 & -3 & 4 & -4 & 0 \end{bmatrix}$$

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201. If A $= \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ p & q & r \end{bmatrix}$, show that ltbargt $A^3 = pI + qA + rA^2$

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202. If ω is a complex cube root of unity, show that

$$\left(\begin{bmatrix}1 & \omega & \omega^2\\ \omega & \omega^2 & 1\\ \omega^2 & 1 & \omega\end{bmatrix}+\begin{bmatrix}\omega & \omega^2 & 1\\ \omega^2 & 1 & \omega\\ \omega & \omega^2 & 1\end{bmatrix}\right)\begin{bmatrix}1 & \omega & \omega^2\end{bmatrix}=\begin{bmatrix}0 & 0 & 0\end{bmatrix}$$

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203. If $A=\begin{bmatrix}1 & -2 & 3\\ 0 & 2 & -1\\ -4 & 5- & 2\end{bmatrix}$, find A (adj A) .

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204. If $A=\begin{bmatrix}4 & -1 & -4\\ 3 & 0 & -4\\ 3 & -1 & -3\end{bmatrix}$, show that $A^2=I_3$.

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205. If $\begin{bmatrix}1 & 1 & x\end{bmatrix}\begin{bmatrix}1 & 0 & 2\\ 0 & 2 & 1\\ 2 & 1 & 0\end{bmatrix}\begin{bmatrix}1\\ 1\\ 1\end{bmatrix}=0$, find x.

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206. If $[2357][1-3-24]=[-46-9x]$, find $x\cdot$

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207. If $\begin{bmatrix} x & 4 & 1 \end{bmatrix}\begin{bmatrix} 2 & 1 & 2 \\ 1 & 0 & 2 \\ 0 & 2 & -4 \end{bmatrix}\begin{bmatrix} x \\ 4 \\ -1 \end{bmatrix}=0$, find $x\cdot$

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208. If $\begin{bmatrix} 1 & -1 & x \end{bmatrix}\begin{bmatrix} 0 & 1 & -1 \\ 2 & 1 & 3 \\ 1 & 1 & 1 \end{bmatrix}\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}=0$, find $x\cdot$

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209. If $A=\begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$ and $I=\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then prove that $A^2-A+2I=O$.

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210. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then find λ so that $A^2 = 5A + \lambda I$

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211. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 7I^2 = O$.

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212. If $A = \begin{bmatrix} 2 & 3 \\ -1 & 0 \end{bmatrix}$, show that $A^2 - 2A + 3I^2 = O$.

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213. Show that the matrix $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ satisfies the equation $A^3 - 4A^2 + A = O$.

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214. Show that the matrix $A = \begin{bmatrix} 5 & 3 \\ 12 & 7 \end{bmatrix}$ then show $A^2 - 12A - I = O$.

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215. If $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$, find $A^2 - 5A - 14I$.

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216. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 7I = O$. Use this to find A^4

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217. If $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$, find k such that $A^2 - kA - 2I^2$=O .

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218. If $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$, find k such that $A^2 - 8A + kI = O$.

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219. If $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ and $f(x) = x^2 - 2x - 3$, show that $f(A) = O$.

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220. Find $\frac{dy}{dx}$ if $\log y = 5x^2$

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221. Find the value of x for which the matrix product $\begin{bmatrix} 2 & 0 & 7 \\ 0 & 1 & 0 \\ 1 & -2 & 1 \end{bmatrix} \begin{bmatrix} -x & 14x & 7x \\ 0 & 1 & 0 \\ x & -4x & -2x \end{bmatrix}$ equal to an identity matrix.

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222. Solve the matrix equations: $\begin{bmatrix} x & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x & 5 \end{bmatrix} = 0$

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223. Solve the matrix equations: $[2x \;\; 3] \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix} \begin{bmatrix} x \\ 8 \end{bmatrix} = 0$

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224. If $A = \begin{bmatrix} 1 & 2 & 0 \\ 3 & -4 & 5 \\ 0 & -1 & 3 \end{bmatrix}$, compute $A^2 - 4A + 3I$.

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225. If $f(x) = x^2 - 2x$, find $f(A)$, where $A = \begin{bmatrix} 0 & 1 & 2 \\ 4 & 5 & 0 \\ 0 & 2 & 3 \end{bmatrix}$.

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226. If $f(x) = x^3 + 4x^2 - x$, find $f(A)$, where $A = \begin{bmatrix} 0 & 1 & 2 \\ 2 & -3 & 0 \\ 1 & -1 & 0 \end{bmatrix}$.

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227. If $A = [102021203]$, then show that A is a root of the polynomial $f(x) = x^3 - 6x^2 + 7x + 2$.

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228. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, then prove that $A^2 - 4A - 5I = O$.

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229. If $A = \begin{bmatrix} 3 & 2 & 0 \\ 1 & 4 & 0 \\ 0 & 0 & 5 \end{bmatrix}$, show that $A^2 - 7A + 10I = O$.

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230. Without using the concept of inverse of a matrix, find the matrix $[xyzu]$ such that $\begin{bmatrix} 5 & -7 \\ -2 & 3 \end{bmatrix}\begin{bmatrix} x & y \\ z & u \end{bmatrix} = \begin{bmatrix} -16 & -6 \\ 7 & 2 \end{bmatrix}$.

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231. Find the matrix A such that : $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}A = \begin{bmatrix} 3 & 3 & 5 \\ 1 & 0 & 1 \end{bmatrix}$ (ii) $A\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} = \begin{bmatrix} -7 & -8 & -9 \\ 2 & 4 & 6 \end{bmatrix}$

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232. Find the matrix A such that : $[413]A = [-484-121-363]$ (iv) $[2\ \ 1\ \ 3][-10-1-110011][10-1] = A$

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233. Find a 2×2 matrix A such that $A\begin{bmatrix}1 & -2\\ 1 & 4\end{bmatrix} = 6I_2$.

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234. If $A = \begin{bmatrix}0 & 0\\ 4 & 0\end{bmatrix}$, find A^{16} .

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235. Four uniform spheres, with masses $m_A = 40kg, m_B = 35kg, m_C = 200kg$, and m_D = 50 kg, have (x,y) coordinates of (0, 50 cm), (0, 0), (–80 cm, 0), and (40 cm, 0), respectively. In unit-vector notation, what is the net gravitational force on sphere B due to the other spheres?

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236. If $A = \begin{bmatrix} 1 & 0 & -3 \\ 2 & 1 & 3 \\ 0 & 1 & 1 \end{bmatrix}$, then verify that $A^2 + A = A(A+I)$, where I is the identity matrix.

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237. If $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$, then find $A^2 - 5A - 14I$..

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238. If $P(x) = [\cos x \sin x - \sin x \cos x]$, then show that `P(x)P(y)=P(x+y) .

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239. If $P = \begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$ and $Q = \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$, prove that $PQ = \begin{bmatrix} xa & 0 & 0 \\ 0 & yb & 0 \\ 0 & 0 & zc \end{bmatrix} = QP$

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240. If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$, find $A^2 - 5A + 4I$ and hence find a matrix X such that $A^2 - 5A + 4I + X = O$.

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241. If $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$, prove that $A^n = \begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix}$ for all positive integers n.

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242. If $A = \begin{bmatrix} a & b \\ 0 & 1 \end{bmatrix}$, prove that $A^n = \begin{bmatrix} a^n & b\left(\frac{a^n - 1}{a - 1}\right) \\ 0 & 1 \end{bmatrix}$ for every positive integer n.

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243. If $A = [\cos\theta i \sin\theta i \sin\theta \cos\theta]$, then prove by principle of mathematical induction that $A^n = [\cos n\,\theta i \sin n\,\theta i \sin n\,\theta \cos n\,\theta]$ for all $n \in N$.

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244. If $A = \left[\cos\alpha + \sin\alpha, \sqrt{2}\sin\alpha; \; -\sqrt{2}\sin\alpha, \cos\alpha - \sin\alpha\right]$, prove that

$$A^n = \left[\cos n\,\alpha + \sin n\,\alpha, \sqrt{2}\sin n\,\alpha; \; -\sqrt{2}\sin n\,\alpha, \cos n\,\alpha - \sin n\,\alpha\right]$$

for all $n \in N$.

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245. If $A = [111011001]$, then use the principle of mathematical induction to show that $A^n = [1nn(n+1)/201n001]$ for every positive integer n.

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246. If $B, \ C$ are n rowed square matrices and if $A = B + C$, $BC = CB$, $C^2 = O$, then show that for every $n \in N$, $A^{n+1} = B^n(B + (n+1)C)$.

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247. If $A = diag\,(a \ \ b \ \ c)$, show that $A^n = diag\,(a^n \ \ b^n \ \ c^n)$ for all positive integer n.

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248. If A is a square matrix, using mathematical induction prove that $(A^T)^n = (A^n)^T$ for all $n \in N$.

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249. A matrix X has $a+b$ rows and $a+2$ columns while the matrix Y has $b+1$ rows and $a+3$ columns. Both matrices XY and YX exist. Find a and b. Can you say XY and YX are of the same type? Are they equal.

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250. Give examples of matrices A and B such that $AB \neq BA$.(ii) A and B such that $AB = O$ but $A \neq O,\ B \neq O$

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251. Give examples of matrices A and B such that $AB = O$ but $BA \neq O$.(ii) $A,\ B$ and C such that $AB = AC$ but $B \neq C,\ A \neq O$.

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252. Let A and B be square matrices of the same order. Does $(A+B)^2 = A^2 + 2AB + B^2$ hold? If not, why?

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253. If A and B are square matrices of the same order, explain, why in general $(A+B)^2 \neq A^2 + 2AB + B^2$ (ii) $(A-B)^2 \neq A^2 - 2AB + B^2$ (iii) $(A+B)(A-B) \neq A^2 - B^2$.

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254. Let A and B be square matrices of the order 3×3 . Is $(AB)^2 = A^2B^2$? Give reasons.

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255. If A and B are square matrices of the same order such that $AB = BA$, then show that $(A+B)^2 = A^2 + 2AB + B^2$.

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256. Let $A = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 3 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 1 \\ 5 & 2 \\ -2 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 4 & 2 \\ -3 & 5 \\ 5 & 0 \end{bmatrix}$. Verify that $AB = AC$ though $B \neq C,\ A \neq O$.

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257. Three shopkeepers $A,\ B\ and\ C$ go to a store to buy stationary. A purchases 12 dozen notebooks, 5 dozen pens and 6 dozen pencils. B purchases 10 dozen notebooks, 6 dozen pens and 7 dozen pencils. C purchases 11 dozen notebooks, 13 dozen pens and 8 dozen pencils. A notebook costs 40 paise, a pen costs Rs. 1.25 and a pencil costs 35 paise. Use matrix multiplication to calculate each individuals bill.

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258. The cooperative stores of a particular school has 10 dozen physics books, 8 dozen chemistry books and 5 dozen mathematics books. Their selling prices are Rs. 8.30, Rs. 3.45 and Rs. 4.50 each respectively. Find the total amount the store will receive from selling all the items.

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259. In a legislative assembly election, a political group hired a public relations firm to promote its candidate in three ways: telephone, house calls, and letters. The cost per contact (in paise) is given in matrix A as A= [40 100 50] teleph0ne housecalls letter The no. of contacts of each type made in two cities Xand Y is given by B=[1000 500 5000] [3000 1000 10000] Find the total amount spent by the group in the two cities X and Y

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260. A trust fund has Rs. 30000 that must be invested in two different types of bonds. The first bond pays 5% interest per year, and the second bond pays 7% interest per year. Using matrix multiplication, determine how to divide Rs 30000 among the two types of bonds. If the trust fund must obtain an annual total interest of Rs 2000.

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261. To promote making of toilets for women, an organisation tried to generate awareness attempt (i) house calls (ii) letters, and (iii) announcements. The cost for each mode per attempt is given below: (i) Rs 50 (ii) Rs 20 (iii) Rs 40 The number of attempts made in three villages X, Y and Z are given below: (i) (ii) (iii) X 400 300 100 Y 300 250 75 Z 500 400 150 Find the total cost incurred by the organisation for three villages separately, using matrices.

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262. There are two families A and B.In family A, there are 4 men, 6 women and 2 children : and in family B, there are 2 men, 2 women and 4 children. The recommended daily requirement of Calories is Men: 2400 ; Women: 1900 ; Children: 1800 Also daily requirement for protein is Men: 55 gm ; Women:45 gm and Children:33 gm Calculate the total requirement of calories and proteins for each of the two families. Using matrix method.

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263. In a parliament election, a political party hired a public relations firm to promote its candidates in three ways telephone, house calls and letters. The cost per contact (in paisa) is given in matrix A as $A = [140200150]$ Telephone House\calls Letters. The number of contacts of each type made in two cities X and Y is given in the matrix B as

Telephone House call Letters

$B = [1000 \quad 500 \quad 50003000 \quad 1000 \quad 10000] City\ X City\ Y$

Find the total amount spent by the party in the two cities. What should one consider before casting his/her vote partys promotional activity or their social activities?

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264. The monthly incomes of Aryan and Babban are in the ratio 3 : 4 and their monthly expenditures are in the ratio 5 : 7. If each saves Rs. 15000 per month, find their monthly incomes using matrix method. This problem reflects which value?

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265. A trust invested some money in two types of bonds. The first bond pays 10% interest and second bond pays 12% interest. The trust received Rs. 2,800 as interest. However, if trust had interchanged money in bonds, they would have got Rs. 100 less as interest. Using matrix method, find the amount invested by the trust.

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266. If $A = [\text{-1/2/3}]$ and $B = [-2 \quad -1 \quad -4]$, verify that $(AB)^T = B^T A^T$

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267. If $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, then find the values of θ satisfying the equation $A^T + A = I_2$.

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268. If $A = [(122)[, (21-2), (a2b)]$ is a matrix satisfying $AA^T = 9I_3$, then find the values of a and b .

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269. Find the values of x, y, z if the matrix $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ satisfy the equation $A^T A = I_3$

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270. Let $A = \begin{bmatrix} 2 & -3 \\ -7 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 2 & -4 \end{bmatrix}$, verify that $(2A)^T = 2A^T$ (ii) $(A+B)^T = A^T + B^T$ (iii) $(A-B)^T = A^T - B^T$ (iv) $(AB)^T = B^T A^T$

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271. If $A = \begin{bmatrix} 3 \\ 5 \\ 2 \end{bmatrix}$ and $B = [1 \ 0 \ 4]$, verify that $(AB)^T = B^T A^T$.

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272. Let $A = [1 - 10213121] and B = [123213011]$. Find A^T, B^T and verify that $(A+B)^T = A^T + B^T$ (ii) $(AB)^T = B^T A^T$ $(2A)^T = 2A^T$

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273. If $A = \begin{bmatrix} -2 \\ 4 \\ 5 \end{bmatrix}, B = \begin{bmatrix} 1 & 3 & -6 \end{bmatrix}$, verify that $(AB)' = B'A'$.

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274. If $A = \begin{bmatrix} 2 & 4 & -1 \\ -1 & 0 & 2 \end{bmatrix}, B = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 2 & 1 \end{bmatrix}$, find $(AB)^T$.

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275. For the matrices A and B, $A = \begin{bmatrix} 2 & 1 & 3 \\ 4 & 1 & 0 \end{bmatrix}, B = \begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 5 & 0 \end{bmatrix}$ verify that $(AB)^T = B^T A^T$

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276. For two matrices A and B, verify that $(AB)^T = B^T A^T$, where $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}, B = \begin{bmatrix} 1 & 4 \\ 2 & 5 \end{bmatrix}$

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277. If $A^T = [34 - 1201]$ and $B = [-121123]$, find $A^T - B^T$.

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278. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then verify that $A^T A = I_2$.

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279. If $A = \begin{bmatrix} \sin\alpha & \cos\alpha \\ -\cos\alpha & \sin\alpha \end{bmatrix}$, verify that $A^T A = I_2$

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280. Let $l_i, m_i, n_i; i = 1, 2, 3$ be the direction cosines of three mutually perpendicular vectors in space. Show that $\forall ' = I_3$ where

$$A = \begin{bmatrix} l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \\ l_3 & m_3 & n_3 \end{bmatrix}$$

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281. Show that the elements on the main diagonal of a skew-symmetric matrix are all zero.

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282. If the matrix $A = \begin{bmatrix} 0 & a & -3 \\ 2 & 0 & -1 \\ b & 1 & 0 \end{bmatrix}$ is skew-symmetric, find the values of $a, \ b$.

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283. Let A be a square matrix. Then prove that $(i) A + A^T$ is a symmetric matrix,$(ii) A - A^T$ is a skew-symmetric matrix and$(iii) \forall^T$ and A^TA` are symmetric matrices.

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284. Prove that every square matrix can be uniquely expressed as the sum of a symmetric matrix and a skew-symmetric matrix.

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285. If A and B are symmetric matrices, then show that AB is symmetric if $AB = BA$ i.e. A and B commute.

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286. Show that the matrix $B^T AB$ is symmetric or skew-symmetric according as A is symmetric or skew-symmetric.

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287. Let A and B be symmetric matrices of same order. Then $AB - BA$ is a skew symmetric matrix

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288. Express the matrix $A = \begin{vmatrix} 3 & 2 & 3 \\ 4 & 5 & 3 \\ 2 & 4 & 5 \end{vmatrix}$ as the sum of a symmetric and a skew-symmetric matrix.

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289. Show that all positive integral powers of a symmetric matrix are symmetric.

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290. Show that positive odd integral powers of a skew-symmetric matrix are skew-symmetric and positive even integral powers of a skew-symmetric matrix are symmetric.

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291. A matrix which is both symmetric as well as skew-symmetric is a null matrix.

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292. If $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$, prove that $A - A^T$ is a skew-symmetric matrix.

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293. If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, show that $A - A^T$ is a skew symmetric matrix.

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294. If the matrix $A = \begin{bmatrix} 5 & 2 & x \\ y & z & -3 \\ 4 & t & -7 \end{bmatrix}$ is a symmetric matrix, find $x, \ y, \ z$ and t.

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295. Let $A = \begin{vmatrix} 3 & 2 & 7 \\ 1 & 4 & 3 \\ -2 & 5 & 8 \end{vmatrix}$. Find matrices X and Y such that $X + Y = A$, where X is a symmetric and Y is a skew-symmetric matrix.

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296. Express the matrix $A = \begin{bmatrix} 4 & 2 & -1 \\ 3 & 5 & 7 \\ 1 & -2 & 1 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrix.

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297. Define a symmetric matrix. Prove that for $A = [2456]$, $A + A^T$ is a symmetric matrix where A^T is the transpose of A.

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298. Express the matrix $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrix.

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299. Express the matrix $A = \begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{bmatrix}$ as the sum of a symmetric and skew-symmetric matrix and verify your result.

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300. If A is an $m \times n$ matrix and B is $n \times p$ matrix does AB exist? If yes, write its order.

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301. If $A = \begin{bmatrix} 2 & 1 & 4 \\ 4 & 1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 \\ 2 & 2 \\ 1 & 3 \end{bmatrix}$. Write the orders of AB and BA.

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302. If $A = \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} -4 \\ 3 \end{bmatrix}$, write AB.

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303. If $A = \begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$, write AA^T.

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304. Give an example of two non-zero 2×2 matrices A and B such that $AB = O$.

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305. If $A = \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$, find $A + A^T$.

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306. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$, write A^2.

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307. If $A = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$, when $A + A^T = I$ find x satisfying $0 < x < \frac{\pi}{2}$

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308. If $A = \begin{bmatrix} \cos x & -\sin x \\ \sin x & \cos x \end{bmatrix}$, find AA^T

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309. If $\begin{bmatrix} 1 & 0 \\ y & 5 \end{bmatrix} + 2\begin{bmatrix} x & 0 \\ 1 & -2 \end{bmatrix} = I$, where I is 2×2 unit matrix. Find x and y.

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310. If matrix $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ and $A^2 = kA,$ then write the value of k

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311. If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ satisfies $A^4 = \lambda A$, then write the value of λ

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312. If $A = \begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$, find A^2.

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313. If $A = \begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$, find A^3.

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314. If $A = \begin{bmatrix} -3 & 0 \\ 0 & -3 \end{bmatrix}$, find A^4.

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315. If $\begin{bmatrix} x & 2 \end{bmatrix}\begin{bmatrix} 3 \\ 4 \end{bmatrix} = 2$, find x

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316. If $A = [a_{ij}]$ is a 2×2 matrix such that $a_{ij} = i + 2j$, write A.

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317. Find a matrix $A, \quad \text{if} \quad A + \begin{bmatrix} 2 & 3 \\ -1 & 4 \end{bmatrix} = \begin{bmatrix} 3 & -6 \\ -3 & 8 \end{bmatrix}$

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318. If $A = [a_{ij}]$ is a square matrix such that $a_{ij} = i^2 - j^2$, then write whether A is symmetric or skew-symmetric.

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319. For any square matrix write whether AA^T is symmetric or skew-symmetric.

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320. If $A = [a_{ij}]$ is a skew-symmetric matrix, then write the value of $\sum_i a_{ii}$.

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321. If $A = [a_{ij}]$ is a skew-symmetric matrix, then write the value of $\sum_i \sum_j a_{ij}$.

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322. If A and B are symmetric matrices, then write the condition for which AB is also symmetric.

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323. If B is a skew-symmetric matrix, write whether the matrix $AB\,A^T$ is symmetric or skew-symmetric.

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324. If B is a symmetric matrix, write whether the matrix $AB\,A^T$ is symmetric or skew-symmetric.

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325. If A is a skew-symmetric and $n \in N$ such that $(A^n)^T = \lambda\,A^n$, write the value of λ

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326. If A is a symmetric matrix and $n \in N$, write whether A^n is symmetric or skew-symmetric or neither of these two.

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327. If A is a skew-symmetric matrix and n is an even natural number, write whether A^n is symmetric or skew-symmetric matrix or neither of the two

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328. If A and B are symmetric matrices of the same order, write whether $AB - BA$ is symmetric or skew-symmetric or neither of the two.

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329. Write a square matrix which is both symmetric as well as skew-symmetric.

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330. Find the values of x and y, if $2\begin{bmatrix}1 & 3\\ 0 & x\end{bmatrix}+\begin{bmatrix}y & 0\\ 1 & 2\end{bmatrix}=\begin{bmatrix}5 & 6\\ 1 & 8\end{bmatrix}$.

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331. If $\begin{bmatrix}x+3 & 4\\ y & -4x+y\end{bmatrix}=\begin{bmatrix}5 & 4\\ 3 & 9\end{bmatrix}$, find x and y

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332. Find the value of x from the following: $\begin{bmatrix}2x & -y\\ 5 & 3y\end{bmatrix}=\begin{bmatrix}6 & 5\\ 3 & -2\end{bmatrix}$

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333. Find the value of y, if $\begin{bmatrix} x-y & 2 \\ x & 5 \end{bmatrix} = \begin{bmatrix} 2 & 2 \\ 3 & 5 \end{bmatrix}$.

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334. Find the value of x , if $\begin{bmatrix} 3x+y & -y \\ 2y-x & 3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ -5 & 3 \end{bmatrix}$.

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335. If matrix $A = [1 \ \ 2 \ \ 3]$, write AA^T .

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336. If $\begin{bmatrix} 2x+y & 3y \\ 0 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 6 & 4 \end{bmatrix}$, then find x .

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337. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, find $A + A^T$.

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338. If $\begin{bmatrix} a+b & 2 \\ 5 & b \end{bmatrix} = \begin{bmatrix} 6 & 5 \\ 2 & 2 \end{bmatrix}$, then find a.

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339. If A is a matrix of order 3×4 and B is a matrix of order 4×3, find the order of the matrix of AB.

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340. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ is identity matrix, then write the value of α.

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341. If $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ 2 & 5 \end{bmatrix} = \begin{bmatrix} 7 & 11 \\ 23 & k \end{bmatrix}$, then write the value of k.

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342. If I is the identity matrix and A is a square matrix such that $A^2 = A$, then what is the value of $(I + A)^2 - 3A$?

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343. If $A = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ is written as $B + C$, where B is a symmetric matrix and C is a skew-symmetric matrix, then find B.

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344. If A is 2×3 matrix and B is a matrix such that $A^T B$ and BA^T both are defined, then what is the order of B ?

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345. What is the total number of 2×2 matrices with each entry 0 or 1?

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346. If $\begin{vmatrix} x & x-y \\ 2x+y & 7 \end{vmatrix} = \begin{vmatrix} 3 & 1 \\ 8 & 7 \end{vmatrix}$, then find the value of y

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347. If a matrix has 5 elements, write all possible orders it can have.

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348. For a 2×2 matrix $A = [a_{ij}]$ whose elements are given by $a_{ij} = \frac{i}{j}$, write the value of a_{12}.

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349. If $x\,[23]+y[-11]=[105]$, find the value of x and y

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350. If $[9-14-213]=A+[12-1049]$, then find matrix $A\cdot$

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351. If $\begin{bmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{bmatrix}=\begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$, find the value of $b\cdot$

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352. For what value of x is the matrix $A=\begin{bmatrix} 0 & 1 & -2 \\ 1 & 0 & 3 \\ x & 3 & 0 \end{bmatrix}$ a skew-symmetric matrix?

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353. If matrix $A = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$ and $A^2 = pA$, then write the value of p.

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354. If A is a square matrix such that $A^2 = A$, then write the value of $7A - (I + A)^3$, where I is the identity matrix.

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355. If $2\begin{vmatrix} 3 & 4 \\ 5 & x \end{vmatrix} + \begin{vmatrix} 1 & y \\ 0 & 1 \end{vmatrix} = \begin{vmatrix} 7 & 0 \\ 10 & 5 \end{vmatrix}$, find $x - y$.

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356. If $[x \quad 1]\begin{bmatrix} 1 & 0 \\ -2 & 0 \end{bmatrix} = O$, find x.

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357. If [a+4 3b8-6] $= [2a + 2b + 28a - 8b]$, write the value of $a - 2b$.

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358. Write a 2×2 matrix which is both symmetric and skew-symmetric.

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359. If $\begin{bmatrix} xy & 4 \\ z+6 & x+y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$, write the value of $(x + y + z)$.

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360. Construct a 2×2 matrix $A = [a_{ij}]$ whose elements a_{ij} are given by

$$a_{ij} = \begin{cases} \frac{|-3i + j|}{2}, & \text{if} \quad i \neq j(i + j)^2, & \text{if} \quad i = j \end{cases}$$

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361. If $[x+yx-y]=[2143][1-2]$, then write the value of $(x,\ y)$.

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362. Matrix $A=\begin{bmatrix}0 & 2b & -2\\ 3 & 1 & 3\\ 3a & 3 & -1\end{bmatrix}$ is given to be symmetric, find the values of a and b .

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363. Write the number of all possible matrices of order 2×2 with each entry 1, 2 or 3.

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364. If $[2\ \ 1\ \ 3][-10-1-110011][10-1]=A$, then write the order of matrix A .

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365. If $A = [3579]$ is written as $A = P + Q$, where P is symmetric and Q is skew-symmetric matrix, then write the matrix P.

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366. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1 \end{bmatrix}$, then A^2 is equal to (a) a null matrix (b) a unit matrix (c) A (d) A

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367. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$, $n \in N$, then A^{4n} equals $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$

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368. If A and B are two matrices such that $AB = A$ and $BA = B$, then B^2 is equal to (a) B (b) A (c) 1 (d) 0

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369. If $AB = A$ and $BA = B$, where A and B are square matrices, then $B^2 = B$ and $A^2 = A$ (b) $B^2 \neq B$ and $A^2 = A$ (c) $A^2 \neq A$, $B^2 = B$ (d) $A^2 \neq A$, $B^2 \neq B$

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370. If A and B are two matrices such that AB=B and BA=A , then $A^2 + B^2 =$

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371. If $\begin{bmatrix} \cos\frac{2\pi}{7} & -\sin\frac{2\pi}{7} \\ \sin\frac{2\pi}{7} & \cos\frac{2\pi}{7} \end{bmatrix}^k = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then the least positive integral value of k, is

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372. If the matrix AB is zero, then It is not necessary that either $A = O$ or, $B = O$ (b) $A = O$ or $B = O$ (c) $A = O$ and $B = 0$ (d) all the above statements are wrong

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373. Let $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, then A^n is equal to $\begin{bmatrix} a^n & 0 & 0 \\ 0 & a^n & 0 \\ 0 & 0 & a \end{bmatrix}$ (b) $\begin{bmatrix} a^n & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$ (c) $\begin{bmatrix} a^n & 0 & 0 \\ 0 & a^n & 0 \\ 0 & 0 & a^n \end{bmatrix}$ (d) $\begin{bmatrix} na & 0 & 0 \\ 0 & na & 0 \\ 0 & 0 & na \end{bmatrix}$

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374. If A, B are square matrices of order 3, A is non-singular and $AB = O$, then B is a (a) null matrix (b) singular matrix (c) unit matrix (d) non-singular matrix

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375. If $A = \begin{bmatrix} n & 0 & 0 \\ 0 & n & 0 \\ 0 & 0 & n \end{bmatrix}$ and $B = \begin{bmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{bmatrix}$, then AB is equal to

(A) B (B) nB (C) B^n (D) $A + B$

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376. If $A = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$, then A^n (where $n \in N$) equals (a) $\begin{bmatrix} 1 & na \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & n^2a \\ 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & na \\ 0 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} n & na \\ 0 & n \end{bmatrix}$

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377. If $A = \begin{bmatrix} 1 & 2 & x \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 & y \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $AB = I_3$, then $x + y$ equals (a) 0 (b) -1 (c) 2 (d) none of these

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378. If $A = [1 - 12 - 1]$, $B = [a1b - 1]$ and $(A + B)^2 = A^2 + B^2$, then values of a and b are $a = 4 , b = 1$ (b) $a = 1 , b = 4$ (c) $a = 0 , b = 4$ (d) $a = 2 , b = 4$

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379. If $A = [\alpha\beta\gamma - \alpha]$ is such that $A^2 = I$, then $1 + \alpha^2 + \beta\gamma = 0$ (b) $1 - \alpha^2 + \beta\gamma = 0$ (c) $1 - \alpha^2 - \beta\gamma = 0$ (d) $1 + \alpha^2 - \beta\gamma = 0$

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380. If $S = [S_{ij}]$ is a scalar matrix such that $s_{ii} = kandA$ is a square matrix of the same order, then $AS = SA = ?$ A^k (b) $k + A$ (c) kA (d) kS

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381. If a square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to A (b) $I - A$ (c) I (d) $3A$

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382. If a matrix A is both symmetric and skew-symmetric, then A is a diagonal matrix (b) A is a zero matrix (c) A is a scalar matrix (d) A is a square matrix

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383. The matrix $\begin{bmatrix} 0 & 5 & -7 \\ -5 & 0 & 11 \\ 7 & -11 & 0 \end{bmatrix}$ is (a) a skew-symmetric matrix (b) a symmetric matrix (c) a diagonal matrix (d) an upper triangular matrix

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384. If A is a square matrix, then AA is a (a) skew-symmetric matrix (b) symmetric matrix (c) diagonal matrix (d) none of these

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385. If A and B are symmetric matrices, then ABA is (a) symmetric matrix (b) skew-symmetric matrix (c) diagonal matrix (d) scalar matrix

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386. If $A = \begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ and $A = A^T$, then a) $x = 0, \ \ y = 5$ (b) $x + y = 5$ (c) $x = y$ (d) none of these

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387. If A is 3×4 matrix and B is a matrix such that $A^T B$ and BA^T are both defined. Then, B is of the type (a) 3×4 (b) 3×3 (c) 4×4 (d) 4×3

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388. If $A = [a_{ij}]$ is a square matrix of even order such that $a_{ij} = i^2 - j^2$, then (a) A is a skew-symmetric matrix and $|A| = 0$ (b) A is symmetric matrix and $|A|$ is a square (c) A is symmetric matrix and $|A| = 0$ (d) none of these

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389. If $A = [\cos\theta - \sin\theta \sin\theta \cos\theta]$, then $A^T + A = I_2$, if $\theta = n\pi, \ n \in Z$ (b) $\theta = (2n+1)\frac{\pi}{2}, \ n \in Z$ (c) $\theta = 2n\,\pi + \frac{\pi}{3}, \ n \in Z$

(d) none of these

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390. If $A = \begin{bmatrix} 2 & 0 & -3 \\ 4 & 3 & 1 \\ -5 & 7 & 2 \end{bmatrix}$ is expressed as the sum of a symmetric and skew-symmetric matrix, then the symmetric matrix is (a) $\begin{bmatrix} 2 & 2 & -4 \\ 2 & 3 & 4 \\ -4 & 4 & 2 \end{bmatrix}$

(b) $\begin{bmatrix} 2 & 4 & -5 \\ 0 & 3 & 7 \\ -3 & 1 & 2 \end{bmatrix}$ (c) $\begin{bmatrix} 4 & 4 & -8 \\ 4 & 6 & 8 \\ -8 & 8 & 4 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

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391. Out of the following matrices, choose that matrix which is a scalar matrix: a) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

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392. The number of all possible matrices of order 3×3 with each entry 0 or 1 is (a) 27 (b) 18 (c) 81 (d) 512

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393. Which of the given values of x and y make the following pairs of matrices equal? $\begin{bmatrix} 3x+7 & 5y+1 \\ 2 & -3x \end{bmatrix}$ and, $\begin{bmatrix} 0 & y-2 \\ 8 & 4 \end{bmatrix}$ a) $x = -\frac{1}{3},\ y = 7$ (b) $y = 7,\ x = -\frac{2}{3}$ (c) $x = -\frac{1}{3},\ y = -\frac{2}{5}$ (d) Not possible to find

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394. If $A = \begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}$ and $kA = \begin{bmatrix} 0 & 3a \\ 2b & 24 \end{bmatrix}$, then the values of $k,\ a,\ b$, are respectively (a) -6, -12, -18 (b) -6, 4, 9 (c) -6, -4, -9 (d) -6, 12, 18

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395. If $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $J = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then B equals a) $I\cos\theta + J\sin\theta$ (b) $I\sin\theta + J\cos\theta$ (c) $I\cos\theta - J\sin\theta$ (d) $I\cos\theta + J\sin\theta$

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396. The trace of the matrix $A = \begin{bmatrix} 1 & -5 & 7 \\ 0 & 7 & 9 \\ 11 & 8 & 9 \end{bmatrix}$ is (a) 17 (b) 25 (c) 3 (d) 12

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397. If $A = [a_{ij}]$ is a scalar matrix of order $n \times n$ such that $a_{ii} = k$ for all i, then trace of A is equal to nk (b) $n + k$ (c) $\frac{n}{k}$ (d) none of these

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398. The matrix A= $\begin{bmatrix} 0 & 0 & 4 \\ 0 & 4 & 0 \\ 4 & 0 & 0 \end{bmatrix}$ is a (a) square matrix (b) diagonal matrix (c) unit matrix (d) none of these

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399. The number of possible matrices of order 3×3 with each entry 2 or 0 is (a) 9 (b) 27 (c) 81 (d) none of these

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400. If $[2x + y, 4x, 5x - 74x] = [77y - 13yx + 6]$, then the value of $x + y$ is $x = 3$, $y = 1$ (b) $x = 2$, $y = 3$ (c) $x = 2$, $y = 4$ (d) $x = 3$, $y = 3$

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401. If A is a square matrix such that $A^2 = I$, then $(A - I)^3 + (A + I)^3 - 7A$ is equal to (a) A (b) $I - A$ (c) $I + A$ (d) $3A$

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402. If A and B are two matrices of the order $3 \times m$ and $3 \times n$, respectively and $m = n$, then order of matrix $(5A - 2B)$ is (a) $m \times 3$ (b) 3×3 (c) $m \times n$ (d) $3 \times n$

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403. If A is a matrix of order $m \times n$ and B is a matrix such that AB^T and $B^T A$ are both defined, then the order of matrix B is (a) $m \times n$ (b) $n \times n$ (c) $n \times m$ (d) $m \times m$

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404. If A and B are matrices of the same order, then $AB^T - BA^T$ is a (a) skew-symmetric matrix (b) null matrix (c) unit matrix (d) symmetric matrix

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405. If matrix $A = \left(\left[a_{ij}\right]\right)_{2 \times 2}$, where $a_{ij} = \{1, \quad \text{if} \quad i \neq j0, \quad \text{if} \quad i = j$, then A^2 is equal to I (b) A (c) O (d) I

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406. If $A = \frac{1}{\pi}\begin{bmatrix} \sin^{-1}(\pi x) & \tan^{-1}\left(\frac{x}{\pi}\right) \\ \sin^{-1}\left(\frac{x}{\pi}\right) & \cot^{-1}(\pi x) \end{bmatrix}$ and $B = \frac{1}{\pi}\begin{bmatrix} -\cos^{-1}(\pi x) & \tan^{-1}\left(\frac{x}{\pi}\right) \\ \sin^{-1}\left(\frac{x}{\pi}\right) & -\tan^{-1}(\pi x) \end{bmatrix}$, then $A - B$ is equal to I (b) 0 (c) $2I$ (d) $\frac{1}{2}I$

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407. If A and B are square matrices of the same order, then $(A+B)(A-B)$ is equal to A^2-B^2 (b) $A^2-BA-AB-B^2$ (c) $A^2-B^2+BA-AB$ (d) A^2-BA+B^2+AB

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408. If $A=\begin{bmatrix}2 & -1 & 3\\ -4 & 5 & 1\end{bmatrix}$ and $B=\begin{bmatrix}2 & 3\\ 4 & -2\\ 1 & 5\end{bmatrix}$, then only AB is defined (b) only BA is defined (c) AB and BA both are defined (d) AB and BA both are not defined

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409. The matrix $A=\begin{bmatrix}0 & -5 & 8\\ 5 & 0 & 12\\ -8 & -12 & 0\end{bmatrix}$ is a (a) diagonal matrix (b) symmetric matrix (c) skew-symmetric matrix (d) scalar matrix

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410. The matrix $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ is (a) identity matrix (b) symmetric matrix (c) skew-symmetric matrix (d) diagonal matrix

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